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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/549,320	09/16/2005	Yasushi Sato	0670-7061	8212

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EXAMINER	
LERNER, MARTIN	
ART UNIT	**PAPER NUMBER**
2626	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/23/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/549,320	SATO ET AL.	
	Examiner	Art Unit	
	Martin Lerner	2626	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1 to 8 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1 to 8 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities:

On page 28, line 14, "Step 3" should be –Step S3—.

On page 29, line 3, "Step 6" should be –Step S6—.

Appropriate correction is required.

Claim Rejections - 35 USC § 101

2. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claim 8 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Independent claim 8 does not belong to a recognized statutory category of invention for a process, composition of matter, or product. Independent claim 8 does not set forth a product, but only a program. A program is not a product unless it is recited as being recorded on a computer readable medium. Nor is the claimed program a process or method because it is represented as means rather than steps.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1, 6/1, 7 and 8 are rejected under 35 U.S.C. 102(e) as being anticipated by *Michaelis*.

Regarding independent claims 1, 7, and 8, *Michaelis* discloses a device, method, and computer readable medium having program instructions for improving the intelligibility of speech, comprising:

"a pitch component extraction means which acquires a speech signal representing the waveform of a speech to extract a pitch component of the speech from the speech signal" – an analog speech signal is received, digitized, and separated into individual frames; then spectral analysis is performed on each individual frame to determine a spectral content of the frame; typically, spectral parameters such as amplitude, voicing, and pitch (if any) of sounds will be measured during the spectral analysis (column 4, lines 10 to 18: Figure 2: Step 32); thus, at least a pitch component is extracted from a speech signal as a spectral parameter during spectral analysis;

"gain determination means which determines the gain of the speech signal based on the intensity of the extracted pitch component to amplify or attenuate the speech signal by use of the determined gain" – the spectral content of the frames is next analyzed to determine a sound type associated with each frame; based on the sound type associated with a particular frame, information corresponding to the frame may be modified to improve the intelligibility of the output signal; typically, the modification of the frame information will include boosting or reducing the amplitude of the corresponding frame ("to amplify or attenuate the speech signal by use of the determined gain") (column 4, lines 23 to 30: Figure 2: Step 36); the spectrum of a voiced speech sound includes a fundamental pitch and harmonics thereof (column 4, lines 52 to 54); the amplitude of a frame can be increased by a predetermined gain value, to a predetermined amplitude value, or the amplitude can be increased by an amount that depends upon the amplitudes of other frames within the same speech signal (column 5, lines 4 to 8); for example, when the extracted data indicates that a frame is an initial component of a voiced plosive, the amplitude of the frame preceding the voiced plosive is reduced (column 5, lines 18 to 20); because voiced speech is determined by its fundamental pitch, reducing the amplitude of an initial frame of a voiced plosive corresponds to "determining the gain of the speech signal based on the intensity of the extracted pitch component".

Regarding claim 6/1, *Michaelis* discloses determining spectral parameters of each individual frame, where spectral parameters include pitch and amplitude (column 4, lines 10 to 20: Figure 2: Step 32); pitch of a frame corresponds to an "extracted pitch

component within one time period", and an amplitude of a frame corresponds to "the gain of the speech signal in the time period", as a frame produced by frame separation unit 18 is 20 to 25 milliseconds in length (column 2, lines 64 to 67: Figure 1); additionally, the spectral content of other frames surrounding a particular frame will often be considered (column 4, lines 20 to 22); when the extracted data indicates that a frame is an initial component of a voiced plosive, the amplitude of the frame preceding the voiced plosive is reduced (column 5, lines 18 to 20); thus, an amplitude, or "gain", is reduced based on "a predetermined time period preceding the time period" when surrounding or preceding frames are considered.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 2 to 4 and 6/2 to 6/4 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Michaelis* in view of *Chen et al.*

Concerning claim 2, *Michaelis* omits a variable filter which varies the pass band according to a control and filters the speech signal to thereby extract components within the pass band, and a filter characteristic determination section which, to cause the variable filter to extract the pitch component, identifies the fundamental frequency of the speech based on the speech signal and controls the variable filter so that the filter has a

pass band in which components other than the identified fundamental frequency and vicinity thereof are cut off. However, it is fairly well known to perform preprocessing on a speech signal to filter it so that only the frequencies characteristic of a speech signal are passed.

Concerning claim 2, *Chen et al.* teaches a method of pitch mark determination using a fundamental frequency based adaptable filter, where a pitch of a speech signal is determined by using an adaptable filter to obtain a fundamental frequency from fundamental frequency passband signals. (Abstract) An adaptable filter has a passband that varies with the position of the fundamental frequency signal. It prevents the condition of a conventional bandpass filter, where the passband is constrained to be fixed. (Column 2, Lines 23 to 30) Adaptable filter 110 is used for filtering out the signals other than the fundamental frequency of the periodic voiced speech signal, a vowel for example. (Column 3, Lines 14 to 20: Figure 1) Adaptable filter 110 operates by determining a position x of the first energy peak in a spectrum, and retains a region in the spectrum near the fundamental frequency, while clearing the remaining spectral points to be zero. (Column 3, Lines 49 to 58: Figure 1: Steps 102 and 103, Figure 2: Steps 201 and 201) Advantages are to enhance program performance for achieving accuracy of detecting the pitch, to decrease the workload of manual modification of speech, and to process a large amount of speech for speech synthesis. (Column 1, Lines 26 to 53) It would have been obvious to one having ordinary skill in the art to employ a variable filter to extract a pitch component from a passband, but to cut off components other than the fundamental frequency, as taught by *Chen et al.* in a method

and apparatus for improving speech intelligibility of *Michaelis* for a purpose of achieving increased accuracy in detecting pitch.

Concerning claim 3, *Michaelis* omits a filter characteristic determination section that includes a cepstrum analysis section that identifies as the fundamental frequency of the speech, a frequency at which the cepstrum of the speech signal has a maximum value. However, cepstra are well known parameters in speech recognition, and are known to provide a method for determination of pitch of a speech signal, as the largest peaks in the cepstral domain represent the fundamental frequency or pitch component. Specifically, *Chen et al.* teaches that there are many methods for acquiring the pitch of a speech signal, and that U.S. Patent No. 5,630,015 teaches a method of acquiring a pitch by performing cepstral analysis to obtain a peak of the obtained cepstrum, as an art recognized alternative to a standard autocorrelation method. (Column 1, Lines 54 to 66) It would have been obvious to one having ordinary skill in the art to acquire a fundamental frequency from a speech signal by cepstrum analysis from a maximum value of a cepstrum as taught by *Chen et al.* in a method and apparatus for improving speech intelligibility of *Michaelis* as an art recognized alternative method of pitch determination.

Concerning claim 4, *Chen et al.* teaches that, after the adaptable filter 110 finds the fundamental frequency point, only the spectrum points around the fundamental frequency are retained, and the remaining spectrum points are cleared to zero ("a cross detection section which filters a speech signal to eliminate a band in which the fundamental frequency component is not substantially contained"). (Column 3, Lines 14

to 30: Figure 1: Steps 102 and 103) Then, a set of pitch marks is generated at zero passing positions of the fundamental frequency passband signals by pitch-mark detector 112 ("identifies a timing at which non-eliminated components reach a predetermined value, and identifies the fundamental frequency based on the identified timing"). (Column 3, Lines 31 to 48: Figure 1: Steps 106 to 108)

Concerning claims 6/2 to 6/4, *Michaelis* discloses determining spectral parameters of each individual frame, where spectral parameters include pitch and amplitude (column 4, lines 10 to 20: Figure 2: Step 32); pitch of a frame corresponds to an "extracted pitch component within one time period", and an amplitude of a frame corresponds to "the gain of the speech signal in the time period", as a frame produced by frame separation unit 18 is 20 to 25 milliseconds in length (column 2, lines 64 to 67: Figure 1); additionally, the spectral content of other frames surrounding a particular frame will often be considered (column 4, lines 20 to 22); when the extracted data indicates that a frame is an initial component of a voiced plosive, the amplitude of the frame preceding the voiced plosive is reduced (column 5, lines 18 to 20); thus, an amplitude, or "gain", is reduced based on "a predetermined time period preceding the time period" when surrounding or preceding frames are considered.

7. Claims 5 and 6/5 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Michaelis* in view of *Chen et al.* as applied to claims 1, 2, and 4 above, and further in view of *Nott*.

Concerning claim 5, *Chen et al.* teaches accurately determining pitch from a timing of pitch marks, but does not determine, based on the identified timing, whether or not the speech contains the fundamental frequency component of a certain amount or more, and if not, the cross detection section notifies the variable filter that the pitch component is not contained, and the variable filter cuts off the speech signal in response to the notification that the pitch component is not contained.

Concerning claim 5, however, *Nott* teaches a squelch circuit, where a zero-crossing rate of an audio signal is measured to determine whether the signal contains speech or not. Specifically, a dominant spectral component, or pitch, lies in the range of about 100 Hz to 300 Hz for male voices and from about 200 Hz to 700 Hz for female voices. With noise, however, the frequency of the dominant spectral components covers a much wider range. (Column 1, Line 66 to Column 2, Line 7) A limiting amplifier removes all information that is not near the center of the waveform, so that the resultant spectrum has a dominant spectra enhanced, thus providing a low (100 to 700 Hz) average zero-crossing rate for speech and a higher (800 to 3000 Hz) average zero-crossing rate for noise. (Column 2, Lines 24 to 31) Then, the amplifier is unmuted when the average zero-crossing ("based on the identified timing") suddenly reduces, corresponding to the appearance of speech ("whether or not the speech contains the fundamental frequency component of a certain amount or more"), and if the zero-crossing rate later increases, the receiver is muted ("the variable filter cuts off the speech signal in response to the notification that the pitch component is not contained") when it has risen above a specific threshold. (Column 2, Lines 51 to 63) The objective

is to mute a processing of an audio signal when there is no intelligence being received. (Column 1, Lines 1 to 11) It would have been obvious to one having ordinary skill in the art to apply a method of cutting off a speech signal when no fundamental frequency is present as indicated by zero-crossings as taught by *Nott* in method of determining a fundamental frequency by pitch marks of *Chen et al.* for a purpose of muting an audio signal when no speech is present.

Concerning claim 6/5, *Michaelis* discloses determining spectral parameters of each individual frame, where spectral parameters include pitch and amplitude (column 4, lines 10 to 20: Figure 2: Step 32); pitch of a frame corresponds to an "extracted pitch component within one time period", and an amplitude of a frame corresponds to "the gain of the speech signal in the time period", as a frame produced by frame separation unit 18 is 20 to 25 milliseconds in length (column 2, lines 64 to 67: Figure 1); additionally, the spectral content of other frames surrounding a particular frame will often be considered (column 4, lines 20 to 22); when the extracted data indicates that a frame is an initial component of a voiced plosive, the amplitude of the frame preceding the voiced plosive is reduced (column 5, lines 18 to 20); thus, an amplitude, or "gain", is reduced based on "a predetermined time period preceding the time period" when surrounding or preceding frames are considered.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to Applicants' disclosure.

Kane et al. discloses pitch determination by detecting a peak in a cepstrum. (Column 3, Line 30 to Column 6, Line 43: Figures 1 to 3)

Atal discloses related art.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Martin Lerner whose telephone number is (571) 272-7608. The examiner can normally be reached on 8:30 AM to 6:00 PM Monday to Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David R. Hudspeth can be reached on (571) 272-7843. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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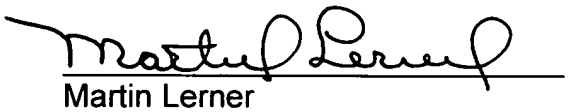

Martin Lerner
Examiner
Group Art Unit 2626